

The opinion in support of the decision being entered today was *not* written for publication and is *not* binding precedent of the Board.

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte ROBERT P. MEAGLEY,
MICHAEL D. GOODNER, E. STEVE PUTNA,
SHAN C. CLARK, and WANG YUEH

Appeal 2007-2417
Application 10/688,521
Technology Center 1700

Decided: August 8, 2007

Before RICHARD E. SCHAFER, SALLY GARDNER LANE, and JAMES
T. MOORE, *Administrative Patent Judges*.

LANE, *Administrative Patent Judge*.

DECISION ON APPEAL

I. Statement of the Case

This ex parte appeal under 35 U.S.C. § 134(a) is from a rejection of claims 1, 3, and 6-12 of Application 10/688,521.

We affirm the Examiner's rejection.

We have jurisdiction under 35 U.S.C. § 6(b).

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Application 10/688,521

The Application was filed on 17 October 2003. The real party in interest is said to be Intel Corporation (Appeal Br. 3).

The following U.S. patents are relied upon by the Examiner:

<u>Name</u>	<u>Patent No.</u>	<u>Issue Date</u>	<u>Filing Date</u>
Hallock et al.	6,582,891	24 Jun. 2003	14 Nov. 2000
Hallock et al.	6,709,807	23 Mar. 2004	09 Oct. 2002

The following published U.S. patent application is relied upon by the Examiner:

<u>Name</u>	<u>Pub. No.</u>	<u>Pub. Date</u>	<u>Filing Date</u>
Verhaverbeke	2004/019066A1	7 Oct. 2004	21 Mar. 2004

The following ground of rejection is appealed:

Claims 1, 3, and 6-12 are rejected under 35 U.S.C. §103(a) as being unpatentable over the Hallock et al. patents (Hallock) in view of the Verhaverbeke published application (Verhaverbeke).

In this decision, we refer to the Applicants Meagley et al. as “Meagley”.

II. Findings of Fact

The record supports the following findings of fact as well as any other findings of fact set forth in this decision by a preponderance of the evidence.

1. The “invention relates generally to semiconductor processing and, particularly, to the formation of photoresists.” (Specification 1).

2. Photoresists “are used [i]n patterning semiconductor wafers to form integrated circuits.” (Specification 1).
3. The process of forming the patterned photoresist is “subject to so-called line edge roughness” which is “surface roughness in the patterned photoresist features” that can lead to leakage of the transistor. (Specification 1-2).
4. The claimed invention is said to address the line edge roughness problem by treating the photoresist with a plasticizer in a supercritical fluid after developing the photoresist and then reflowing the photoresist. (Specification 4-5).
5. The plasticizer is said to be “a liquid, gas, combined gas and liquid phases, or super-critical and liquid gases, including supercritical carbon dioxide, liquid carbon dioxide, or ethane.” (Specification 5).

6. According to the Meagley Specification:

A plasticizer can lower the glass transition temperature of the Photoresist mask...allowing rough resist lines to flow and level to reduce overall line edge roughness. The molecules to be absorbed may be introduced into the photoresist in a gas phase, a liquid phase, a combination of gas or liquid, or in a supercritical fluid. .

(Specification 6).

7. For example, the plasticizer may be the vapor phase of a solvent such as ethyl lactate. (Specification 6-7).
8. Claim 1 is representative of all the rejected claims:¹

¹ Meagley does not argue any of its claims separately.

A method comprising:

developing a patterned photoresist:

absorbing a plasticizer in a supercritical fluid into the surface of said patterned photoresist after developing the photoresist; and
reflowing the photoresist after absorbing the plasticizer.

9. The Hallock patents each teach a process for reducing line edge roughness from the surface of a patterned photoresist. (Hallock at 1:15-20 and 2:33-36).
10. The process entails “exposing the patterned photoresist to a vapor and then heating the substrate having the photoresist thereon [to allow for reflow] to a temperature and for a time sufficient to decrease edge roughness at the surfaces.” (Hallock at 6:18-25 and 40-54).
11. The vapor may be formed from a solvent such as ethyl lactate. (Hallock at 7:1-10).
12. Verhaverbeke teaches “methods ...using supercritical fluids...in semiconductor applications.” (Verhaverbeke at 0002).
13. Verhaverbeke discusses an embodiment where “photoresist patterns after development, such as the photoresist layer... may be dried to advantage with a supercritical fluid...” (Verhaverbeke at 0047).
14. Verhaverbeke discusses another embodiment where a supercritical fluid is used to cure a photoresist layer. (Verhaverbeke at 0060).
15. According to Verhaverbeke, use of the drying supercritical fluid is useful to avoid collapse of the developed photoresist pattern and

allows the photoresist “to retain the shape and integrity of its patterned features.” (Verhaverbeke at 0047 and 0060).

16. Carbon dioxide is identified as a preferred supercritical fluid.
(Verhaverbeke at 0021).

III. Issue

Whether Meagley has shown that the Examiner’s rejection of claims 1, 3, and 6-12 under 35 U.S.C. §103(a) as being unpatentable over Hallock in view of Verhaverbeke is in error based on an improper combination of the teachings of the references?

IV. Legal Principles

“A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.” 35 USC § 103(a).

In determining whether claimed subject matter would have been obvious we take into consideration (1) the scope and content of the prior art, (2) any differences between the claimed invention and the prior art, (3) the level of skill in the art, and (4) any relevant objection evidence of obviousness or non-obviousness. *KSR Int’l Co. v. Teleflex, Inc.*, 127 S.Ct. 1727, 1730, 82 USPQ2d 1385, 1388 (2007), *Graham v. John Deere Co. of Kansas City*, 383 U.S. 1, 17-18 (1966). The references of record may be

relied upon to show the level of skill in the art. *In re GPAC*, 57 F.3d 1573, 1579, 35 USPQ2d 1116, 1121 (Fed. Cir. 1995).

There need not be explicit suggestion in the prior art to combine the teachings of prior art references. As stated by the Supreme Court, “[t]he obviousness analysis cannot be confined by a formalistic conception of the words teaching, suggestion, and motivation, or by overemphasis on the importance of published articles and the explicit content of issued patents.” *KSR*, 127 S. Ct. 1741, 82 USPQ2d 1396. Therefore, “[t]he combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results.” *KSR*, 127 S.Ct. at 1739, 82 USPQ2d at 1395.

“In determining whether the subject matter of a ...claim is obvious, neither the particular motivation nor the avowed purpose of the [Applicant] controls.” *KSR*, 127 S.Ct. 1742, 82 USPQ2d 1397. Thus, obviousness does not require a suggestion in or expectation from the prior art that the claimed invention will have the properties discovered by Applicant. *In re Dillon*, 929 F.2d 688, 693, 16 USPQ2d 1897, 1901-02 (Fed. Cir. 1990).

We have considered only those arguments made before us in coming to our decision. Arguments not made are waived. See 37 C.F.R. § 41.37(c) (1) (vii) (2004).

V. Analysis

Claims 1, 3, and 6-12 are rejected over the combination of Hallock and Verhaverbeke.

The Examiner found that Hallock teaches each feature of the claimed invention except that Hallock does not teach that a supercritical fluid is

added to the plasticizer that is absorbed onto the photoresist after development.

Meagley does not take issue with the Examiner's finding. Instead, Meagley argues that "there is a total absence of teaching or rationale to combine [Hallock and Verhaverbeke]. (Appeal Br. 9).

First Meagley argues that "Verhaverbeke has nothing to do with a photoresist." (Appeal Br. A 9). However, as the Examiner pointed out Verhaverbeke discusses employing a supercritical fluid to remove fluids from a developed, i.e., patterned, photoresist (Answer 6-9).

Meagley next argues that one skilled in the art would have had no reason to combine Verhaverbeke with Hallock since Hallock is concerned with reducing line edge roughness and Verhaverbeke is not.

We do not agree. The reason for combining the references need not be to achieve a result sought by Applicant. *KSR*, 127 S.Ct. 1732, 82 USPQ2d 1397. Verhaverbeke teaches that removal of water/solvent after development through the use of a supercritical fluid has the advantages of keeping the photoresist pattern from collapsing and allowing the photoresist "to retain the shape and integrity of its patterned features." Thus, one skilled in the art would have had a reason to add a supercritical fluid to the process of Hallock, i.e., to obtain the advantages discussed in Verhaverbeke.

In its reply brief, Meagley argues that the Examiner improperly relied upon a teaching in Verhaverbeke that is directed to removal of photoresists. (Reply Br. at 2). While Verhaverbeke discusses the use of a supercritical fluid to remove a photoresist (Verhaverbeke at 005700), we do not understand the Examiner to be relying upon that portion of Verhaverbeke.

Instead, the Examiner discusses an embodiment of Verhaverbeke where a supercritical fluid is used for drying a developed photoresist (at 0047) and another embodiment of Verhaverbeke where a supercritical fluid is used to cure a photoresist layer and acts to remove solvent (at 0060). Either of these portions of Verhaverbeke would have made it obvious to use a supercritical fluid in the process taught by Hallock.

Finally, Meagley argues that there is “no reason to plasticize in the course of drying” by combining the plasticizer and the supercritical fluid. (Reply Br. at 2). One skilled in the art would have had sufficient reason to combine two known steps into one with the expectation of achieving the results each step is said to produce. The claimed invention appears to simply combine two known techniques, i.e., plasticizing and drying or curing with a supercritical fluid, without achieving any unpredictable result. We conclude that such a combination would have been obvious.

VI. Order

Upon consideration of the record and for reasons given, it is

ORDERED that the Examiner’s rejection of claims 1, 3, and 6-12 under 35 U.S.C. §103(a) as being unpatentable over Hallock in view of Verhaverbeke et al. is AFFIRMED; and

FURTHER ORDERED that no time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1) (iv) (2006).

AFFIRMED

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